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ARKEMA INC.  
PATENT DEPARTMENT - 26TH FLOOR  
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EXAMINER

VAN, LUAN V

ART UNIT PAPER NUMBER

1753

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/620,042	MARTYAK, NICHOLAS	
	Examiner	Art Unit	
	Luan V. Van	1753	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 February 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 25-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                        |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/27/04</u> . | 6) <input type="checkbox"/> Other: _____   |

12.

**DETAILED ACTION**

***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-24, drawn to a method, classified in class 205, subclass 291.
- II. Claim 25-27, drawn to a product, classified in class 257, subclass 594.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the product can be made by either sputter or chemical vapor deposition.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper, restriction for examination purposes as indicated is proper.

During a telephone conversation with the applicant's representative, Stephen Boyd, on 7/1/05 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-24. Affirmation of this election must be made by applicant

Art Unit: 1753

in replying to this Office action. Invention of Group II is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Oath/Declaration***

The CIP application date of 09/667268 should be 09/22/**2000** -- not 09/22/2002.

***Specification***

The disclosure is objected to because of the following informalities:

Page 10, paragraph 35: the R" and R' should be shown to bond with the carbon and not with the sulfuric acid group.

Appropriate correction is required.

***Claim Objections***

Claims 2 and 16 are objected to because of the following informalities:

The R" and R' should be shown to bond with the carbon and not with the sulfuric acid group.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 recites the limitation of alkyl sulfonic acid, alkyl poly-sulfonic acid, and aryl sulfonic acid in claim 1. The limitation lacks positive antecedent basis. Claim 4 is prosecuted based on the assumption that it is dependent on claim 3.

Claim 4 includes improper alternative language (MPEP 2173.05(h)). The word "and" before propanesulfonic, pentanesulfonic, and tolylsulfonic should be replaced with -- or --.

Claim 4 is unclear with the use of "and" before alkyl sulfonic acid, alkyl poly-sulfonic acid, and aryl sulfonic acid. The present form appears to mean that all three groups are present simultaneously instead of one compound selected from a group. It should be replaced with -- or --.

***Claim Rejections - 35 USC § 102***

Art Unit: 1753

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Proell.

Regarding claim 1, Proell teaches a solution for copper electroplating which contains copper alkanesulfonate salts (column 2 lines 48-55) and free alkanesulfonic acids (column 3 lines 13-16), wherein the free acid has a concentration from about 5 to about 50 grams per liter of solution (column 3 lines 16-23). This is equivalent to a concentration of 0.04 to 0.44 M by converting grams per liter to M using the alkanesulfonic acid molecular weight of 113 (column 2 lines 54-55). This concentration range is within the range of the instant claim. Plating of micron dimensioned trenches or vias, through-holes and microvias is an intended use of the solution and is not given patentable weight.

Regarding claims 2, and 4-5, Proell teaches the alkanesulfonic acid comprises methane sulfonic acid (column 3 lines 30-34), where a, b, c, and y is equal to 1, and R, R', and R'' are hydrogen.

Art Unit: 1753

Regarding claim 3, Proell teaches the alkanesulfonic acid comprises methanesulfonic acid (column 3 lines 30-34), which is an alkyl monosulfonic acid.

Regarding claim 6, Proell teaches the acid solution is a mixture of an alkanesulfonic acid with other acids (column 3 lines 30-34).

Regarding claim 9, Proell teaches the pH of the solution is about 1.15 (column 3 lines 45-46), which is within the range of the instant claim.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1753

Claims 7-8, 10-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Proell in view of Dahms et al.

Proell teaches the copper electroplating method as described above in addressing claims 1-6 and 9.

Regarding claim 7, Proell does not explicitly teach an electroplating solution with chloride ions.

Dahms et al. teach an electroplating solution with chloride ions with a concentration of 0.01-0.18 g/liter (column 8 lines 10-15), which is within the range of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating solution of Proell by using the solution of Dahms et al., because an electroplating solution with halogen ions is suitable for electroplating copper and is conventionally known in the art.

Regarding claim 8, Proell teaches that it is "desirable" to maintain free acid in the solution. However, it does not preclude that no free acid is used.



It would have been obvious to one having ordinary skill in the art to modify the acid concentration to obtain a solution with no free acid, because free acid is not necessary to electroplate copper, and using no free acid is within the ability of one having ordinary skill in the art.

Regarding claim 10, Proell does not explicitly teach using a mixture of copper alkanesulfonate with other salts.

Dahms et al. teach using a mixture of copper sulfate, or other copper salts (column 8 lines 15-16) which would include copper alkanesulfonate, and iron sulfate (column 7 lines 37-48).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by using a mixture of a copper alkanesulfonate with other metal salts as taught by Dahms et al., because the other metal salts help to maintain a constant concentration of the copper ions in the solution (column 7 lines 4-27).

Regarding claims 11-14, Proell does not explicitly teach using additives in the plating solution.

Art Unit: 1753

Regarding claim 11, Dahms et al. teach a polyethylene glycol suppressor additive (table 1).

Regarding claim 12, Dahms et al. teach a sulfur-containing accelerator or brightener agent is in the range of 0.001-0.15 grams per liter (column 8 lines 40-45), which is within the range of the instant claim.

Regarding claim 13, Dahms et al. teach the brightener agent is bis-(w-sulfopropyl)-disulfide, disodium salt (table 2).

Regarding claim 14, Dahms et al. teach a solution containing a nitrogen-containing leveler additive (column 9 lines 17-26).

Relevant to claims 11-14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by using the additives of Dahms et al., because these additives enhance the physical-mechanical and optical properties, such as brightness and uniformity on the substrate surface and within the vias of the substrate, of the metal coating.

Regarding claim 15, Proell teaches a solution for copper electroplating which contains copper alkanesulfonate salts (column 2 lines 48-55) and free alkanesulfonic acids (column 3 lines 13-16), wherein the free acid has a concentration from about 5 to

Art Unit: 1753

about 50 grams per liter of solution (column 3 lines 16-23). This is equivalent to a concentration of 0.04 to 0.44 M by converting grams per liter to M using the alkanesulfonic acid molecular weight of 113 (column 2 lines 54-55). This concentration range is within the range of the instant claim. With respect to passing an electric current for electroplating copper, electroplating or electrodepositing by definition involves passing an electric current through the solution to electroplate a metal on to a substrate.

The difference between the reference to Proell and the instant claim is that the reference does not explicitly teach electroplating micron dimensioned trenches or vias, through-holes and microvias.

Dahms et al. teach electroplating a circuit board with borings or vias of 0.4 mm (column 12 lines 8-15).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by electroplating on micron-size vias as taught by Dahms et al., because electroplating copper on a circuit board with micron-size borings or vias is conventionally known.

Regarding claims 17, 22 and 24, Proell does not explicitly teach electroplating a printed circuit board with a thinly metallized surface containing micron vias. However,

Art Unit: 1753

the plating method of Proell would deposit copper in the vias to provide a copper plate in the absence of dimples, overplate, voids or inclusions, since it is the same solution.

Dahms et al. teach electroplating a printed circuit board with a thinly metallized surface (or thin copper layer) containing micron vias (example 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by electroplating on a circuit board with micron-size vias as taught by Dahms et al., because electroplating copper on a circuit board with micron-size borings or vias is conventionally known.

Regarding claim 18, Proell does not explicitly disclose the type of current used.

Dahms et al. teach electroplating with periodic reverse current (figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by electroplating with periodic reverse current as taught by Dahms et al., because electroplating with periodic reverse current is suitable for plating copper in vias.

Regarding claim 19, Proell teaches using copper anodes (column 4 lines 35-37), which is soluble since copper is being electroplated.

Regarding claim 21, Proell teaches electroplating pure copper.

Regarding claim 20, Proell does not explicitly teach the temperature of the copper electrolyte is between 20°C-70°C.

Dahms et al. teach the temperature of the copper electrolyte is between 15°C-50°C (column 9 lines 35-37), which is within the range of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Proell by using the plating temperature of Dahms et al., because the temperature range is suitable for plating copper in vias.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Proell in view of Dahms et al., and further in view of Ritland et al.

Proell and Dahms et al. teach the copper electroplating method as described above in addressing claims 1-22 and 24. The difference between the references and the instant claim is that the references do not explicitly teach that the vias have an aspect ratio of about 1:1 and diameters of about 1 to 500 microns.

Art Unit: 1753

Ritland et al. teach electroplating (column 9 lines 51-52) copper on to a substrate with holes having an aspect ratios of about 0.5:1 to about 50:1 and diameters of about 2 to 50 mils (column 3 lines 5-43). These ranges are within the ranges of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating combined method of Proell and Dahms et al. by using the substrate with the aspect ratios and diameters of Ritland et al., because electroplating copper onto a substrate with the aspect ratios and diameters of the instant claim is known.

Claims 1-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahms et al. in view of Proell.

Regarding claim 1, Dahms et al. teach a solution for electroplating copper which contains alkanesulfonic acids (column 8 lines 15-18) on a circuit board with borings or vias of 0.4 mm (column 12 lines 8-15). Although Dahms et al. do not explicitly teach copper alkanesulfonate salts, they suggest that these salts can be use in place of copper sulfate (column 8 lines 15-18).

The difference between the reference to Dahms et al. and the instant claims is that the reference does not explicitly teach electroplating with a free acid having a concentration from about 0.05M- 3.5M

Proell teaches a solution containing a free acid having a concentration of 5 to about 50 grams per liter of solution (column 3 lines 16-23). This is equivalent to a concentration of 0.04M to 0.44M by converting grams per liter to M using the alkanesulfonic acid molecular weight of 113 (column 2 lines 54-55). This concentration range is within the range of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating solution of Dahms et al. by using the free acid concentration of Proell, because the concentration is suitable for electroplating copper as taught by Proell.

Regarding claims 2, 4-5 and 16, Dahms et al. teach the alkanesulfonic acid comprises methane sulfonic acid (column 8 lines 15-18), where a, b, c, and y is equal to 1, and R, R', and R" are hydrogen.

Regarding claim 3, Dahms et al. teach the alkanesulfonic acid comprises methanesulfonic acid (column 8 lines 15-18), which is an alkyl monosulfonic acid.

Art Unit: 1753

Regarding claim 6, Dahms et al. teach the acid solution is a mixture of an alkanesulfonic acid with other acids (column 8 lines 15-18).

Regarding claim 7, Dahms et al. teach an electroplating solution with chloride ions with a concentration of 0.01-0.18 g/liter (column 8 lines 10-15), which is within the range of the instant claim.

Regarding claim 8, although Dahms et al. do not explicitly teach free acid, it would have been obvious to one having ordinary skill in the art to modify the acid concentration to obtain a solution with no free acid, because free acid is not necessary to electroplate copper, and using no free acid is within the ability of one having ordinary skill in the art.

Regarding claim 9, Dahms et al. teach the pH of the solution is  $<1$  (column 8 lines 34-35), which is within the range of the instant claim.

Regarding claim 10, Dahms et al. teach using a mixture of copper sulfate, or other copper salts (column 8 lines 15-16) which would include copper alkanesulfonate, and iron sulfate (column 7 lines 37-48).

Regarding claim 11, Dahms et al. teach a polyethylene glycol suppressor additive (table 1).



Regarding claim 12, Dahms et al. teach a sulfur-containing accelerator or brightener agent is in the range of 0.001-0.15 grams per liter (column 8 lines 40-45), which is within the range of the instant claim.

Regarding claim 13, Dahms et al. teach the brightener agent is bis-(w-sulfopropyl)-disulfide, disodium salt (table 2).

Regarding claim 14, Dahms et al. teach a solution containing a nitrogen-containing leveler additive (column 9 lines 17-26).

Regarding claim 15, Dahms et al. teach a process for electroplating copper which contains alkanesulfonic acids (column 8 lines 15-18) on a circuit board with borings or vias of 0.4 mm (column 12 lines 8-15). Although Dahms et al. do not explicitly teach copper alkanesulfonate salts, they suggest that these salts can be use in place of copper sulfate (column 8 lines 15-18). With respect to passing an electric current for electroplating copper, electroplating or electrodepositing by definition involves passing an electric current through the solution to electroplate a metal on to a substrate.

The difference between the reference to Dahms et al. and the instant claims is that the reference does not explicitly teach electroplating with a free acid having a concentration from about 0.05M- 3.5M

Proell teaches a solution and process containing a free acid having a concentration of 5 to about 50 grams per liter of solution (column 3 lines 16-23). This is equivalent to a concentration of 0.04M to 0.44M by converting grams per liter to M using the alkanesulfonic acid molecular weight of 113 (column 2 lines 54-55). This concentration range is within the range of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating method of Dahms et al. by using the free acid concentration of Proell, because the concentration is suitable for electroplating copper as taught by Proell.

Regarding claims 17, 22 and 24, Dahms et al. teach electroplating a printed circuit board with a thinly metallized surface (or thin copper layer) containing micron vias (example 1). The plating method of Dahms et al. would deposit copper in the vias to provide a copper plate in the absence of dimples, overplate, voids or inclusions.

Regarding claim 18, Dahms et al. teach electroplating with periodic reverse current (figure 1).

Regarding claim 19, Dahms et al. teach electroplating with an insoluble anode (column 6 lines 24-26).

Regarding claim 20, Dahms et al. teach the temperature of the copper electrolyte is between 15°C-50°C (column 9 lines 35-37), which is within the range of the instant claim.

Regarding claim 21, Dahms et al. teach electroplating pure copper.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dahms et al. in view of Proell, and further in view of Ritland et al.

Dahms et al. and Proell teach the copper electroplating method as described above in addressing claims 1-22 and 24. The difference between the references and the instant claim is that the references do not explicitly teach that the vias have an aspect ratio of about 1:1 and diameters of about 1 to 500 microns.

Ritland et al. teach electroplating (column 9 lines 51-52) copper on to a substrate with holes having an aspect ratios of about 0.5:1 to about 50:1 and diameters of about 2 to 50 mils (column 3 lines 5-43). These ranges are within the ranges of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electroplating combined method of Dahms et al. and

Art Unit: 1753

Proell by using the substrate with the aspect ratios and diameters of Ritland et al., because electroplating copper onto a substrate with the aspect ratios and diameters of the instant claim is known.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-6, 8-10, 15-16 and 18-19 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,605,204. Although the conflicting claims are not identical, they are not patentably distinct from each other because the range of free acid concentration of the instant invention is a broader range than that of US '204.

Regarding claim 1, US '204 claim a solution for copper electroplating which contains copper alkanesulfonate salts and free alkanesulfonic acids, wherein the free

Art Unit: 1753

acid has a concentration from about 0.25 to about 1.75 M, and which is intended for the metallization of micron-sized dimensioned trenches or vias, through-holes and microvias. (Claim 1)

Regarding claim 2, US '204 claim the alkanesulfonic acid of the anionic portion of the copper salt and any free acid are introduced as an alkyl or aryl sulfonic acid of formula:  $(R^a, R^b \text{ and } R^c) - C - (SO_2OH)_y$  wherein  $a+b+c+y$  equals 4,  $R, R'$  and  $R''$  are the same or different and each independently may be hydrogen, phenyl, Cl, F, Br, I,  $CF_3$  or a lower alkyl group such as  $(CH_2)_n$  where  $n$  is from 1 to 7 and that is unsubstituted or substituted by oxygen, Cl, F, Br, I,  $CF_3$ ,  $-SO_2OH$ . (Claim 2)

Regarding claim 3, US '204 claim a solution wherein the alkanesulfonic acid is derived from an alkyl monosulfonic acid, an alkyl polysulfonic acid or an aryl mono or polysulfonic acid. (Claim 3)

Regarding claim 4, US '204 claim the alkyl sulfonic acid is methanesulfonic, ethanesulfonic and propanesulfonic acids and the alkyl polysulfonic acids are methanedisulfonic acid, monochloromethanedisulfonic acid, dichloromethanedisulfonic acid, 1,1-ethanedisulfonic acid, 2-chloro-1,1-ethanedisulfonic acid, 1,2-dichloro-1,1-ethanedisulfonic acid, 1,1-propanedisulfonic acid, 3-chloro-1,1-propanedisulfonic acid, 1,2-ethylene disulfonic acid, 1,3-propylene disulfonic acid, triluormethanesulfonic acid,

Art Unit: 1753

butanesulfonic acid, perfluorobutanesulfonic acid, and pentanesulfonic acid and the aryl sulfonic acid are phenylsulfonic, phenolsulfonic and tolylsulfonic acids. (Claim 4)

Regarding claim 5, US '204 claim the alkanesulfonic acid is methanesulfonic acid, ethanesulfonic acid, propanesulfonic acid or trifluoromethanesulfonic acid. (Claim 5)

Regarding claim 6, US '204 claim the acid is a mixture of an alkanesulfonic acid with other acids. (Claim 6)

Regarding claim 8, US '204 claim no free acid is used. (Claims 7)

Regarding claim 10, US '204 claim the copper salt is supplied as a mixture of a copper alkanesulfonate with other metal salts selected from metals in Group IB, 2B, 3A, 3B, 4A, 4B, 5B, 6B, 7B, or 8 of the periodic table. (Claim 8)

Regarding claim 15, US '204 claim a process for the metallization of micron dimensioned trenches or vias or through-holes, wherein the process employs an electroplating solution containing copper alkanesulfonate salts and free alkanesulfonic acids, wherein the free acid has a concentration of from about 0.25 to about 1.75 M, and electric current is passed through the solution to electroplate copper onto a substrate. (Claim 10)

Art Unit: 1753

Regarding claim 16, US '204 claim the alkanesulfonic acid of the anionic portion of the copper salt and any free acid are introduced as an alkyl or aryl sulfonic acid of formula:  $(R^a, R^b \text{ and } R^c) - C - (SO_2OH)_y$  wherein  $a+b+l-c-l-y$  equals 4,  $R$ ,  $R'$  and  $R''$  are the same or different and each independently may be hydrogen, phenyl, Cl, F, Br, I,  $CF_3$  or a lower alkyl group such as  $(CH_2)_n$  where  $n$  is from 1 to 7 and that is unsubstituted or substituted by oxygen, Cl, F, Br, I,  $CF_3$ ,  $-SO_2OH$ . (Claim 13)

Regarding claim 18, US '204 claim direct current, pulsed current or periodic reverse current is used. (Claim 12)

Regarding claim 19, US '204 claim a soluble or an insoluble or inert anode is used. (Claim 14)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a broader range of free acid concentration, because the concentration is close enough that one skilled in the art would have expected the electroplating solution to yield a copper having the same properties.

Claims 1-6, 8-10, 15-16 and 18-19 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,605,204 in view of Proell.

Art Unit: 1753

US '204 claim the method as described above in addressing claims 1-6, 8-10, 15-16 and 18-19. The difference between the reference to US '204 and the instant claims is that the reference does not explicitly teach electroplating with a free acid having a concentration from about 0.05M - 3.5M

Proell teaches a solution for copper electroplating with a free acid having a concentration from about 5 to about 50 grams per liter of solution (column 3 lines 16-23). This is equivalent to a concentration of 0.04 to 0.44 M by converting the unit of grams per liter to M using the alkanesulfonic acid molecular weight of 113 (column 2 lines 54-55). This concentration range is within the range of the instant claim.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the free acid concentration of Proell, because the concentration is suitable for electroplating copper as taught by Proell.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan V. Van whose telephone number is 571-272-8521. The examiner can normally be reached on M-F 8:30-5:00.

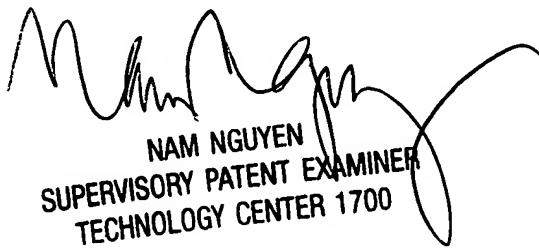


Art Unit: 1753

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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LWV  
7/7/05



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